

## CLAIMS

adda' 1. A semiconductor device package manufacturing method comprising:

5 forming bumps (4, 4A) on element electrodes (5) of a semiconductor device (3) by a wire bonding method; positioning the semiconductor device on a thermoplastic resin sheet (7a);

10 forming a thermoplastic resin portion (7) for covering a portion of the semiconductor device except for end surfaces (9) of the bumps by melting the thermoplastic resin sheet through hot pressing of the thermoplastic resin sheet and the semiconductor device; and

15 cutting the thermoplastic resin portion after the hot pressing.

2. A semiconductor device package manufacturing method comprising:

20 forming by a wire bonding method a bump (4, 4A) on an element electrode (5) of a semiconductor device (3) of an individual piece obtained by dicing a semiconductor wafer (1);

positioning one or a plurality of the semiconductor devices on a thermoplastic resin sheet (7a);

25 forming a thermoplastic resin portion (7) for covering a portion of the semiconductor device except for

an end surface (9) of the bump by melting the thermoplastic resin sheet through hot pressing of the thermoplastic resin sheet and each individual piece of the semiconductor device; and

5 cutting the thermoplastic resin portion after the hot pressing.

3. A semiconductor device package manufacturing method comprising:

10 forming bumps (4, 4A) on semiconductor device electrodes of a semiconductor wafer (1) by a wire bonding method;

dicing the semiconductor wafer on which the bump is formed to divide the wafer into each individual piece of a semiconductor device (3);

15 positioning one or a plurality of the semiconductor devices on a thermoplastic resin sheet (7b);

forming a thermoplastic resin portion (7) for covering a portion of the semiconductor device except for end surfaces (9) of the bumps by melting the thermoplastic resin sheet through hot pressing of the thermoplastic resin sheet and each individual piece of the semiconductor device; and

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cutting the thermoplastic resin portion after the hot pressing.

25 4. A semiconductor device package manufacturing

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method comprising:

forming bumps (4, 4A) on element electrodes (5) of a semiconductor wafer (1) by a wire bonding method;

5 positioning a thermoplastic resin sheet (7a) on the semiconductor wafer;

forming a thermoplastic resin portion (7) for covering a portion of the semiconductor device except for end surfaces (9) of the bumps by melting the thermoplastic resin sheet through hot pressing of the semiconductor wafer and the thermoplastic resin sheet; and

dicing the semiconductor wafer and the thermoplastic resin portion, which have undergone the hot pressing.

5. A semiconductor device package manufacturing method comprising:

printing a circuit pattern with a conductive paste (12) in a thermoplastic resin portion that is located on an end surface side where the bump is exposed and belongs to a semiconductor device package manufactured by the semiconductor device package manufacturing method claimed in claim 1 or claim 2 or claim 3;

hardening the conductive paste with a metallic particle (11) arranged in a specified position of the circuit pattern;

25 forming a thermoplastic resin portion (7c) for

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covering a portion of the semiconductor device except for an end surface of the metallic particle by positioning the semiconductor device package obtained after the hardening of the conductive paste on the thermoplastic resin sheet and melting the thermoplastic resin sheet through hot pressing; and

cutting the thermoplastic resin portion after the hot pressing.

6. A semiconductor device package manufacturing method comprising:

printing a circuit pattern with a conductive paste (12) on an electrode surface side of a semiconductor device package manufactured by the semiconductor device package manufacturing method claimed in claim 5;

hardening the conductive paste with a metallic particle (11) arranged in a specified position of the circuit pattern;

forming a thermoplastic resin portion (7d) for covering a portion of the semiconductor device except for an end surface of the metallic particle by positioning the semiconductor device package obtained after the hardening of the conductive paste on the thermoplastic resin sheet and melting the thermoplastic resin sheet through hot pressing; and

repeating cutting of the thermoplastic resin

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portion after the hot pressing in specified times, thereby forming a multi-layer package.

7. A semiconductor device package manufacturing method comprising:

5           printing a circuit pattern with a conductive paste (12) on an electrode surface side of the semiconductor wafer before the dicing of the semiconductor wafer and the thermoplastic resin portion, which have undergone the hot pressing, according to the semiconductor device package manufacturing method of claim 4;

10           hardening the conductive paste with a metallic particle (11) arranged in a specified position of the circuit pattern;

15           forming a thermoplastic resin portion (7c) for covering a portion of the semiconductor device except for an end surface of the metallic particle by aligning in position the semiconductor wafer obtained after the hardening of the conductive paste with the thermoplastic resin sheet and melting the thermoplastic resin sheet through hot pressing; and

20           dicing the semiconductor wafer that has the metallic particle and has undergone the hot pressing.

8. A semiconductor device package manufacturing method comprising:

25           printing a circuit pattern with a conductive

paste (12) on an electrode surface side of the semiconductor wafer before the dicing of the semiconductor wafer and the thermoplastic resin portion, which have undergone the hot pressing, according to the semiconductor device package manufacturing method of claim 4;

hardening the conductive paste with a metallic particle (11) arranged in a specified position of the circuit pattern; and

obtaining a multi-layer structure by repeating in specified times process of forming a thermoplastic resin portion (7c) for covering a portion of the semiconductor device except for an end surface of the metallic particle by aligning in position the semiconductor wafer obtained after the hardening of the conductive paste with the thermoplastic resin sheet and melting the thermoplastic resin sheet through hot pressing, and thereafter dicing the semiconductor wafer that has the metallic particle and has undergone the hot pressing.

9. A semiconductor device package manufacturing method as claimed in any one of claims 1 through 4 and 6 through 8, wherein when the thermoplastic resin portion (7) is formed, the thermoplastic resin sheet is melted and thereby covering the surface of the semiconductor device on which the bump is formed except for the end surface (9) of the semiconductor device.

10. An electronic component module manufacturing method comprising:

printing a circuit pattern with a conductive paste (12) on a first thermoplastic resin sheet (13);

5 mounting a semiconductor device package manufactured by the semiconductor device package manufacturing method claimed in any one of claim 1 through claim 8 and an electronic component (15) at specified positions of the circuit pattern of the first thermoplastic resin sheet; and

10 forming a thermoplastic resin portion (13B) for covering the semiconductor package and the electronic component by aligning in position a second thermoplastic resin sheet (13A) with the first thermoplastic resin sheet on which the semiconductor device package and the electronic component are mounted and melting the second thermoplastic resin sheet through hot pressing.

11. An electronic component module manufacturing method as claimed in claim 10, wherein when the thermoplastic resin portion (7) is formed, a surface of the semiconductor device on which the bump is formed except for the end surface (9) of the bump of the semiconductor device by melting the thermoplastic resin sheet.

12. A method for manufacturing a noncontact IC card having an antenna coil (26) for executing transmission and

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reception between an IC chip and outside, the method comprising:

printing a circuit pattern capable of being electrically connected to an IC electrode portion of the IC chip or a circuit pattern to be electrically connected to the IC electrode portion including a coil pattern that constitutes the antenna coil on a thermoplastic resin base material (23) with a conductive paste (22);

arranging a semiconductor device package on the circuit pattern in a manner that the IC electrode portion of the IC chip of the semiconductor device package that has the IC chip and is manufactured by the semiconductor device package manufacturing method claimed in any one of claim 1 through claim 9 is connected to the circuit pattern;

hardening the conductive paste;

forming a thermoplastic resin portion (23B) for covering the semiconductor device package by aligning in position a thermoplastic resin sheet (23A) on a semiconductor device package mounting surface side of the thermoplastic resin base material obtained after the hardening of the conductive paste and melting the thermoplastic resin sheet through hot pressing; and

cutting the thermoplastic resin portion after the hot pressing, forming the card.

13. A semiconductor device package manufactured by



the semiconductor device package manufacturing method claimed in any one of claims 1 through 4 and 6 through 8.

14. A semiconductor device package manufactured by the semiconductor device package manufacturing method claimed in claim 9.

15. A semiconductor device-mounted component manufacturing method for performing mounting of a semiconductor device (414) on a circuit pattern (416), which is electrically connected to the semiconductor device while being brought in contact with a bump (413) of the semiconductor device and is formed of a conductive paste on a pattern forming surface (423) of a base material (422), the method comprising:

inserting the semiconductor device into the base material with the bump of the semiconductor device put in an exposed state proximately to the pattern forming surface; and

forming a contact area increasing portion (418, 1131, 1132) for increasing a contact area of the circuit pattern with the bump on the bump exposed on the pattern forming surface.

16. A semiconductor device-mounted component manufacturing method as claimed in claim 15, wherein

the contact area increasing portion is formed of an extension portion-forming member (450, 455, 457) brought

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in contact with the bump or the pattern forming surface located in a vicinity of the bump when the contact area is increased, and

the extension portion-forming member is  
5 pressurized against the bump or the pattern forming surface located in the vicinity of the bump.

17. A semiconductor device-mounted component manufacturing method as claimed in claim 16, wherein, when the extension portion-forming member has a cylindrical  
10 shape, a projecting portion (418) is formed as the contact area increasing portion on the bump formed by a pressurizing operation for performing pressurization with the extension portion-forming member.

18. A semiconductor device-mounted component manufacturing method as claimed in claim 16, wherein, when  
15 the extension portion-forming member has a rugged portion (1561) at its tip (456), a rugged portion (1131) is formed as the contact area increasing portion on the bump formed by a pressurizing operation for performing pressurization  
20 with the extension portion-forming member.

19. A semiconductor device-mounted component manufacturing method as claimed in claim 16, wherein, when the extension portion-forming member has a cylindrical  
25 shape, a contact area increasing groove (1572) is formed in the vicinity of the bump by pressurizing the pattern

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forming surface in the vicinity of the bump by a pressurizing operation for performing pressurization with the extension portion-forming member, thus exposing the bump from the base material.

5 20. A semiconductor device-mounted finished-product manufacturing method for encapsulating a semiconductor device-mounted component (421) manufactured by the semiconductor device-mounted component manufacturing method claimed in any one of claims 15 through 19.

10 21. A semiconductor device-mounted finished-product provided with a semiconductor device-mounted component (421) manufactured by the semiconductor device-mounted component manufacturing method claimed in any one of claims 15 through 19.

15 22. A semiconductor device-mounted finished-product manufactured by the semiconductor device-mounted finished-product manufacturing method claimed in claim 20.

20 23. A semiconductor device-mounted finished-product as claimed in claim 21, wherein the semiconductor device-mounted finished-product is a noncontact IC card.

24. A semiconductor device-mounted finished-product as claimed in claim 22, wherein the semiconductor device-mounted finished-product is a noncontact IC card.

25 25. A semiconductor device-mounted component manufacturing apparatus for performing mounting of a

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semiconductor device (414) on a circuit pattern (416), which is electrically connected to the semiconductor device while being brought in contact with a bump (413) of the semiconductor device and is formed of a conductive paste on a pattern forming surface (423) of a base material (422),  
5 the apparatus comprising:

a semiconductor device pressurizing device (473) for inserting the semiconductor device into the base material with the bump of the semiconductor device put in an exposed state or an unexposed state proximately to the pattern forming surface; and  
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a contact area increasing device (450, 453, 454, 455, 457) for forming a contact area increasing portion (418, 1131, 1132) for increasing a contact area of the circuit pattern with the bump on the bump exposed or located proximately to the pattern forming surface.  
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26. A semiconductor device-mounted component manufacturing apparatus as claimed in claim 25, wherein

the contact area increasing device comprises:

an extension portion-forming member (450, 455, 457) for forming the contact area increasing portion by coming in contact with the bump or in contact with the pattern forming surface located in the vicinity of the bump; and  
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25 an extension portion-forming member-use

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pressurizing device (454) for pressurizing the extension portion-forming member against the bump or the pattern forming surface located in the vicinity of the bump.

27. A semiconductor device-mounted component manufacturing apparatus as claimed in claim 26, wherein

the extension portion-forming member has a cylindrical shape and forms a projecting portion (418) that serves as the contact area increasing portion on the bump formed by a pressurizing operation for performing pressurization with the extension portion-forming member-use pressurizing device.

28. A semiconductor device-mounted component manufacturing apparatus as claimed in claim 26, wherein the extension portion-forming member has at its tip (456) a rugged portion (1561) and forms a rugged portion (1131) as the contact area increasing portion on the bump formed by a pressurizing operation for performing pressurization with the extension portion-forming member-use pressurizing device.

29. A semiconductor device-mounted component manufacturing apparatus as claimed in claim 26, wherein the extension portion-forming member has a cylindrical shape and forms a contact area increasing groove (1572) in the vicinity of the bump by pressurizing the pattern forming surface located in the vicinity of the bump by a

pressurizing operation for performing pressurization with the extension portion-forming member-use pressurizing device, thus exposing the bump from the base material.

30. A semiconductor device-mounted finished-product manufacturing apparatus comprising:

the semiconductor device-mounted component manufacturing apparatus claimed in any one of claims 25 through 29; and

an encapsulating device for encapsulating the semiconductor device-mounted component (421) manufactured by the semiconductor device-mounted component manufacturing apparatus.

31. A semiconductor device-mounted finished-product comprising the semiconductor device-mounted component (421) manufactured by the semiconductor device-mounted component manufacturing apparatus claimed in any one of claims 25 through 29.

32. A semiconductor device-mounted finished-product manufactured by the semiconductor device-mounted finished-product manufacturing apparatus claimed in claim 30.

33. A semiconductor device-mounted finished-product claimed in claim 31, wherein the semiconductor device-mounted finished-product is a noncontact IC card.

34. A semiconductor device-mounted finished-product claimed in claim 32, wherein the semiconductor device-

mounted finished-product is a noncontact IC card.

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